CLAIMS

1. A method for determining the current distribution of an object by measuring the magnetic fields in the vicinity of the object using a multi-channel measurement device that measures an irrotantional and sourceless vector field, whereby one measurement sensor corresponds to each channel, c h a r a c t e r i s e d in that

converting a multi-channel measurement signal corresponding to each measurement sensor into the signals of a predetermined set of virtual sensors; and

determining the current distribution of an object being measured from the signals of the set of virtual sensors in a predetermined function basis to be efficiently calculated.

2. The method as defined in claim 1, c h a r a c t e r i s e d in that the object is approximated using a spherical-harmonic conductor, and a multi-pole development of the field is calculated from the multi-channel measurement signal.

3. The method as defined in claim 2, c h a r a c t e r i s e d in that the multi-pole development is calculated by taking into account the magnetic fields outside the object.

4. The method as defined in claim 2, c h a r a c t e r i s e d in that the multi-pole development is calculated by ignoring the magnetic fields outside the object.

5. The method as defined in claim 2, c h a r a c t e r i s e d in that the external interferences are eliminated using some other known interference eliminating method prior to the conversion.

6. The method as defined in claim 2, c h a r a c t e r i s e d in that as the orthonormal function basis, a current distribution equation of the following form is selected:

$$\overset{\rho}{J}(\overset{\rho}{r}) = \sum_{l=0}^{L} \sum_{m=-l}^{l} c_{lm} f(r) \overset{\rho}{X}lm(\theta,\varphi),$$

wherein $f(r)$ is a freely selectable radial function and $\overset{\rho}{X}lm(\theta,\varphi)$ is so-called vector spherical harmonic.

7. The method as defined in claim 4, c h a r a c t e r i s e d in that

the orthonormal function basis is placed into a current distribution equation; and

the coefficients of the current distribution are analytically solved from the equation:

$$c_{lm} = \hat{\gamma}_l M_{lm} \left[\int_0^R r' f(r) dr \right]^{-1},$$

wherein γ_l is a constant associated with order 1 and R is the radius of the sphere to be examined, and $\overset{\rho}{X}lm(\theta,\varphi)$ is so-called spherical harmonic.

8. The method as defined in claim 4, c h a r a c t e r i s e d in that function $f(r)$ is used to adjust the depth weighing of the current distribution model.

9. A measurement device for determining the current distribution of an object by measuring magnetic fields in the vicinity of the object, the measurement device comprising:

a set of measurement channels (1, 1^1, 1^2, ...1^n) that measure an irrotational and sourceless vector field, in which case at least one measurement sensor 2, 2^1, 2^2,...2^4 corresponds to each channel; and

processing means (3) for processing the measurement signal and in which the object is approximated using a spherical-symmetrical conductor, c h a r a c - t e r i s e d in that

the processing means include a conversion module (4) for converting a multi-channel measurement signal corresponding to each measurement sensor into

the signals of a predetermined set of virtual sensors; and

calculation means (5) for determining the current distribution of an object being examined from the set of virtual sensors using depth r in a predetermined orthonormal function basis.

10. The measurement device as defined in claim 9, c h a r a c t e r i s e d in that the calculation means (5) are arranged to calculate a multipole development from the multi-channel measurement signal.

11. The measurement device as defined in claim 10, c h a r a c t e r i s e d in that the multipole development is calculated by taking into account the magnetic fields outside the object being measured.

12. The measurement device as defined in claim 10, c h a r a c t e r i s e d in that the multipole development is calculated by ignoring the magnetic fields outside the object being measured.

13. The measurement device as defined in claim 10, c h a r a c t e r i s e d in that as the orthonormal function basis, a current distribution equation with the following form is selected:

$$\vec{J}(\vec{r}) = \sum_{l=0}^{L} \sum_{m=-l}^{l} c_{lm} f(r) \vec{X}lm(\theta, \varphi) \, ,$$

wherein $f(r)$ is a radial function to be freely selected.

14. The measurement device as defined in claim 12, c h a r a c t e r i s e d in that

the orthonormal function basis is placed into the current distribution equation; and

the coefficients of the current distribution are solved analytically from the equation:

$$c_{lm} = \hat{\gamma}_l M_{lm} \left[\int_0^R r^l f(r) dr \right]^{-1} ,$$

wherein γ_l is a constant associated with order 1 and R is the radius of the sphere to be examined.

15. The measurement device as defined in claim 13, c h a r a c t e r i s e d in that function $f(r)$ is used to adjust the depth weighing of a current distribution model.

16. The measurement device and analysis software as defined in claim 9, wherein the measurement device converts the signals into a set of virtual sensors prior to their storage, and the analysis software converts the stored data into a current distribution.